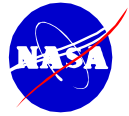




SPACE SHUTTLE PROGRAM
Space Shuttle Program Integration
NASA Johnson Space Center, Houston, Texas



STS-107 Flight Readiness Review

January 9, 2003



Agenda

Presenter

Date **01/09/03**

Page **2**

- **Program Integration - Flight Manager**
 - **Payload Overview**
 - **Key Program Considerations**
 - **Payload & System Safety**
 - **Orbital Debris Status ***
 - **Payload In-Flight Anomalies ***
 - **Launch Commit Criteria ***
- **USA Program Integration ***
- **Boeing Integration ***
- **System Integration TMR**
 - **Requirements Waiver**
- **Flight Readiness Statement**

Vanessa Ellerbe

No Issues

No Issues

No Issues

No Issues

No Issues

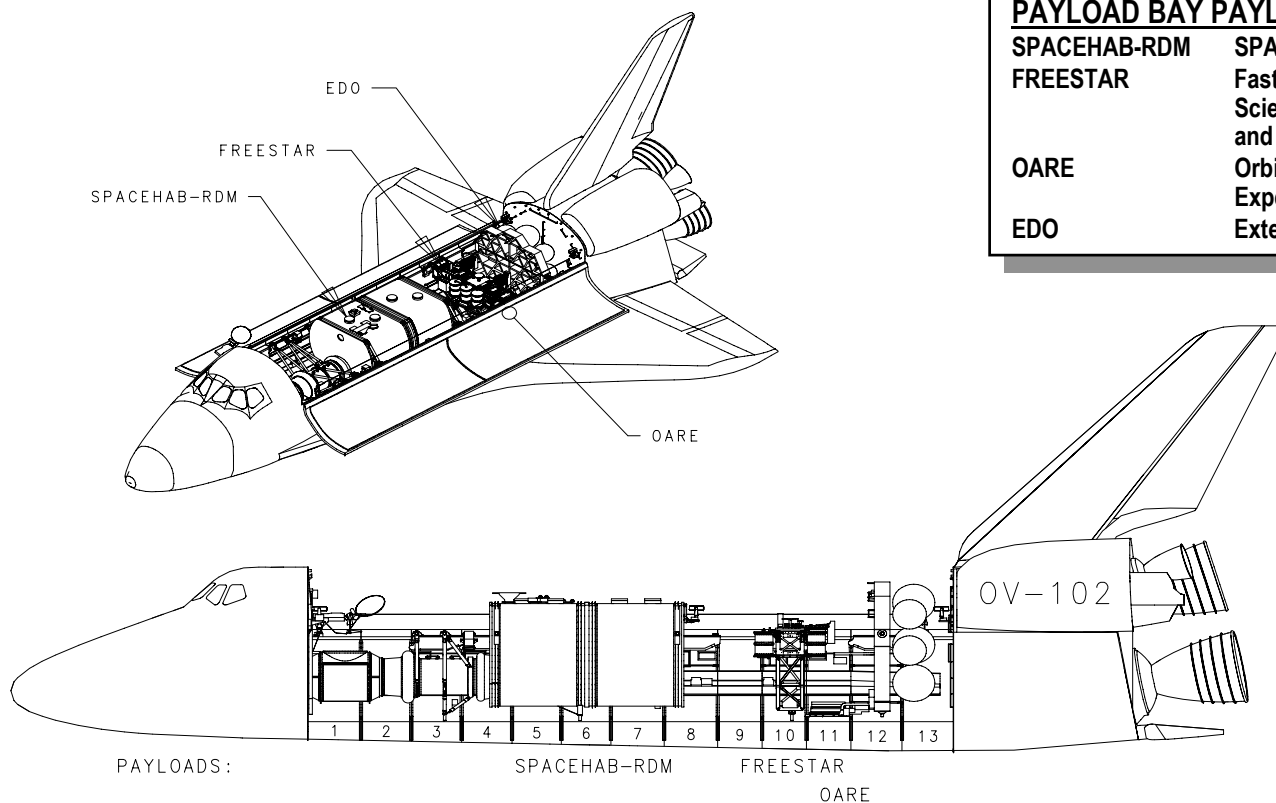
Rod Wallace

*** In Backup Charts**



Cargo Bay Arrangement

Presenter	Vanessa Ellerbe	
Date	01/09/03	Page 3



PAYLOAD BAY PAYLOADS:

SPACEHAB-RDM	SPACEHAB-Research Double Module
FREESTAR	Fast Reaction Experiments Enabling Science, Technology, Applications and Research
OARE	Orbital Acceleration Research Experiment
EDO	Extended Duration Orbiter Pallet

STS-107



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Payload Customers

Presenter **Vanessa Ellerbe**

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Payload Overview

Presenter **Vanessa Ellerbe**

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- **International Science/Research Mission**
 - **SPACEHAB Complement – 30 Microgravity, Space, and Life Sciences Payloads**
 - Commercial (SPACEHAB, Inc. customers)
 - European Space Agency
 - NASA ISS Risk Mitigation Experiment
 - NASA Code U Sponsored
 - **FREESTAR - 6 Earth, Space, & Microgravity Experiments**
 - Mediterranean Israeli Dust Experiment (MEIDEX)
 - Shuttle Ozone Limb Sounding Experiment-2 (SOLSE-2)
 - Critical Viscosity of Xenon-2 (CVX-2)
 - Solar Constant Experiment-3 (SOLCON-3)
 - Space Experiment Module (SEM)
 - Low Power Transceiver (LPT)
 - **RAMBO – DOD Sponsored**



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Module in Cargo Bay

Presenter **Vanessa Ellerbe**

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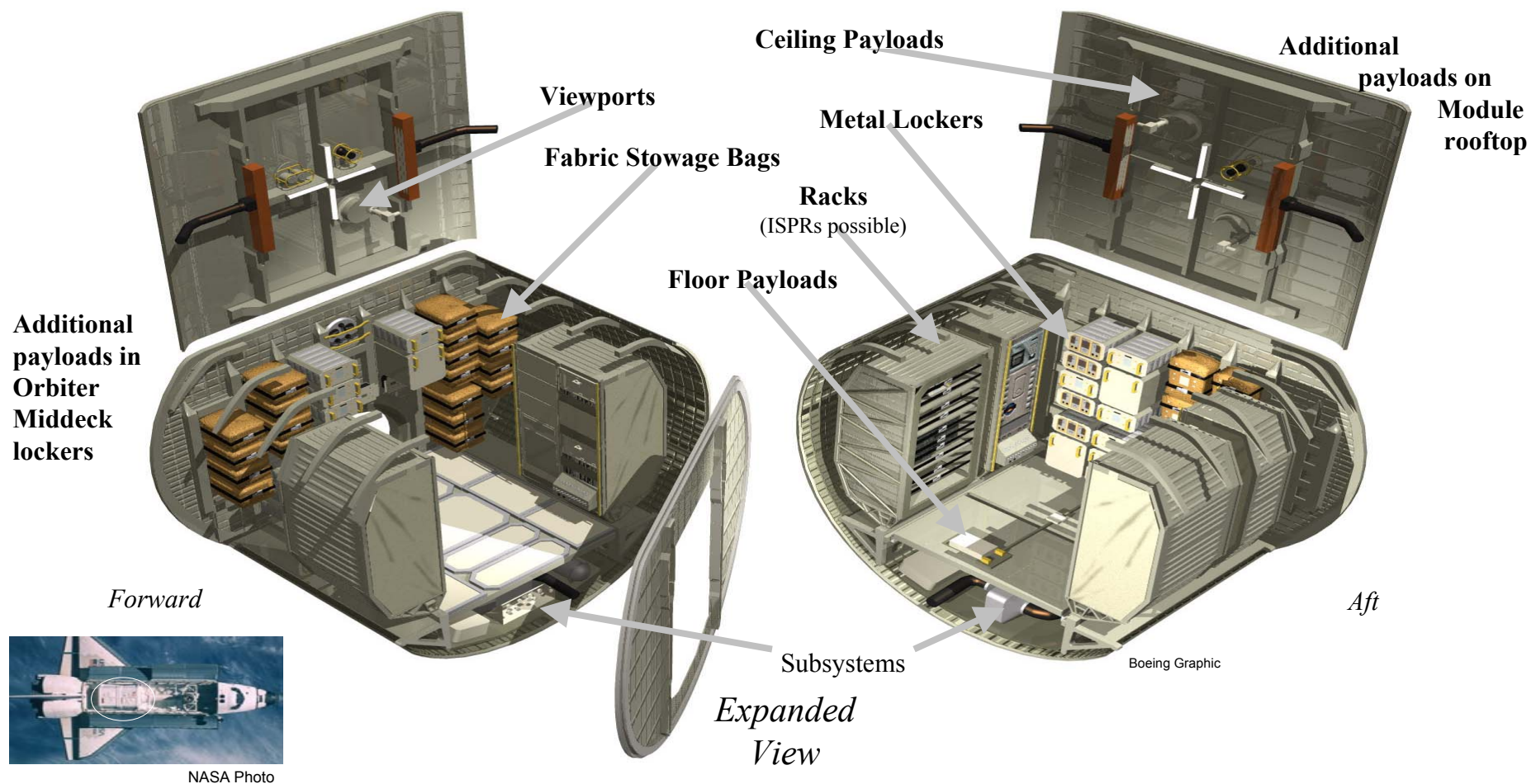


Research Double Module

Presenter **Vanessa Ellerbe**

Date **01/09/03**

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Space Shuttle Program Integration

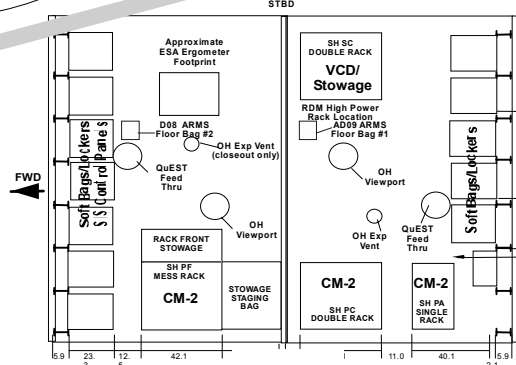
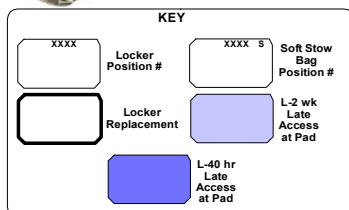
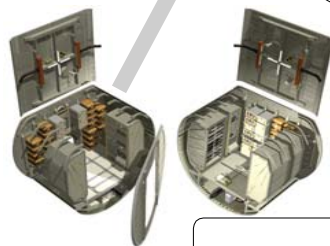
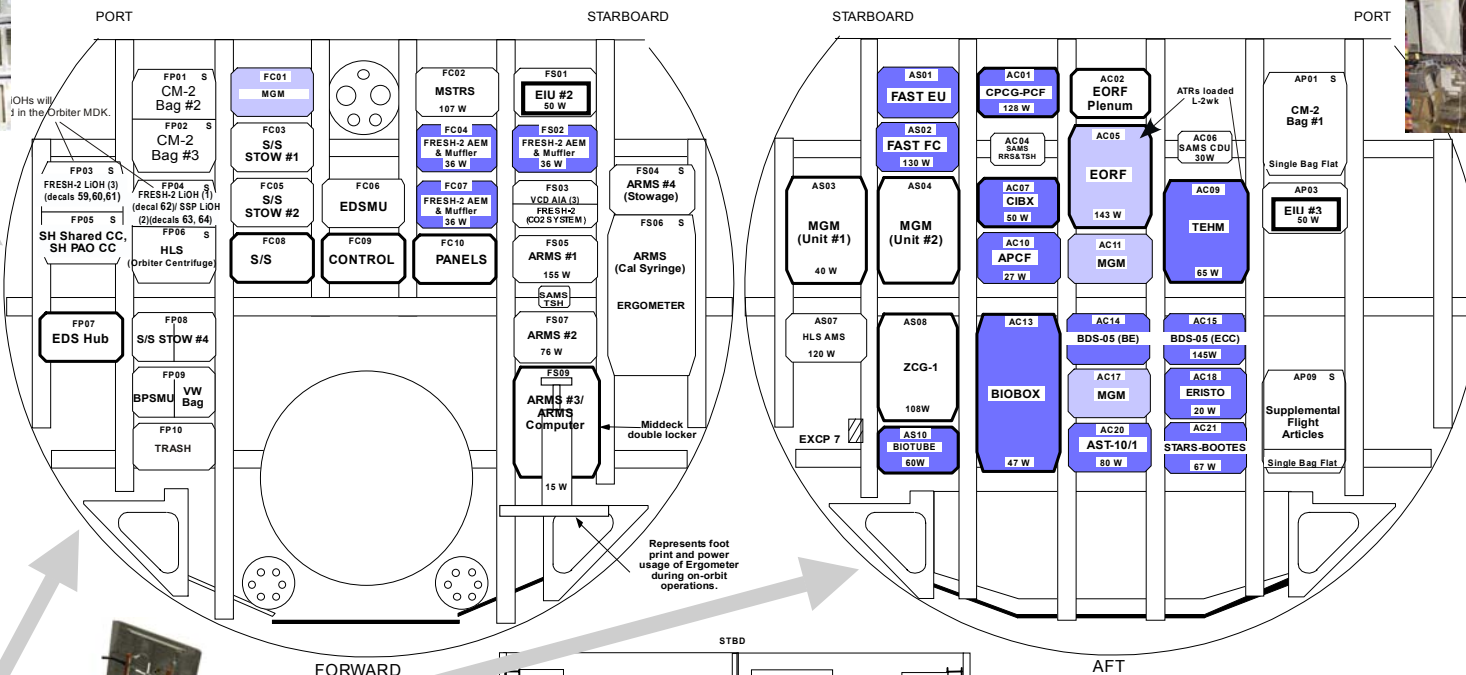
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Module Layout of Experiments

Presenter **Vanessa Ellerbe**

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NOTE: ARMS hardware uses 2 MLEs placed on the forward and aft flight floor.

ORBITER MIDDECK PAYLOADS		
Payload	Description	Late Access
Biopack	2 Locker Facility	Facility Content
CMPCG	5 Lockers Stowage	Locker Content
CEBAS	1 CRIM-M Unit	CRIM-M
	1 Locker Insert	CEBAS Unit
OSTEO	0.5 Locker Stowage	Locker Insert
HLS	1 Locker	Locker Content
BDS-05	1.5 Lockers Stowage	Locker Content
BRIC	1 Locker Stowage	BRIC Unit & Small Tray Content
SH FDF	0.5 Locker Stowage	Tray Content (L-2days)
ZCG (Autoclaves)	1 Locker Stowage	Locker Content
Total: 15.5 MLEs		14 MLEs

SPACEHAB ROOFTOP PAYLOADS	
Acronym	Experiment Title
COM2PLEX	Combined Two-Phase-Loop Experiment
MSTRS	Miniature Satellite Threat Reporting System
StarNav	CSCE & Texas A&M University Experiment



Rack Layout of Experiments



Empty MESS Rack

**SH MESS RACK PORT SIDE
FWD MODULE SEGMENT/
RACK FRONT STOWAGE**

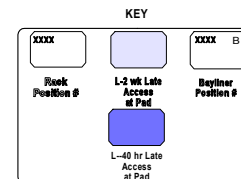
Two will be changed out with the module subfloor LIOH.

PF13 S S/S Stow #3	PF14 S FRESH-2 WRB	PF15 S SSP LIOH (1) (decal 65) / FRESH-2 LIOH(2) (decal SH2, SH3)	PF16 S CM-2 PGSC, VCD FE PGSC, Shared PGSC
PF17 S HLS Bag #1	PF18 S HLS Bag #2	PF19 S HLS Bag #3	PF20 S HLS Bag #4
PF21 S HLS Bag #5	PF22 S HLS Bag #6	PF23 S CWC Entry Container	PF24 S SSP Clothes MS2/ SSP Clothes MS4
PF25 S AST 10/2 <small>Single Bag Flat</small>	PF27 S VCD Box, AST Syringes, 35mm Camera <small>Single Bag Flat</small>		

**SH DOUBLE RACK STARBOARD SIDE
AFT MODULE SEGMENT FWD POSITION**

SC01	SC02 BDS-05 Stowage Caddy	1
	SC04 ZCG-1	1
	SH Record Media Bag	
	SC06 SH FDF	1
VCD FE	VCD FE	
	EPDP	
	RDU	
317 W		

RSC Pipe is
behind soft stow
locations



VCD FE Rack



RDM High Power Rack Location



STS-106 MESS Rack

**SH MESS RACK PORT SIDE
FWD MODULE SEGMENT**

PF01UF	CM-2 (LSP EMS)	
PF01LF	CM-2 (Single Board Computer (3))	PF01LA CM-2 (SOFBALL EMS)
PF04UP	CM-2 (Stowage)	PF04US CM-2 (Stowage)
PF04L	CM-2 (Water Mist EMS)	

Center
Shelf

**SH DOUBLE RACK PORT SIDE
AFT MODULE SEGMENT FWD POSITION**

PC01	
CM-2	
419 W	
EIU #1	RDU

10 May 2002
**CM-2 Double
Rack**

**SH SINGLE RACK PORT SIDE
AFT MODULE SEGMENT AFT
POSITION**

PA01
CM-2

**CM-2 Single
Rack**



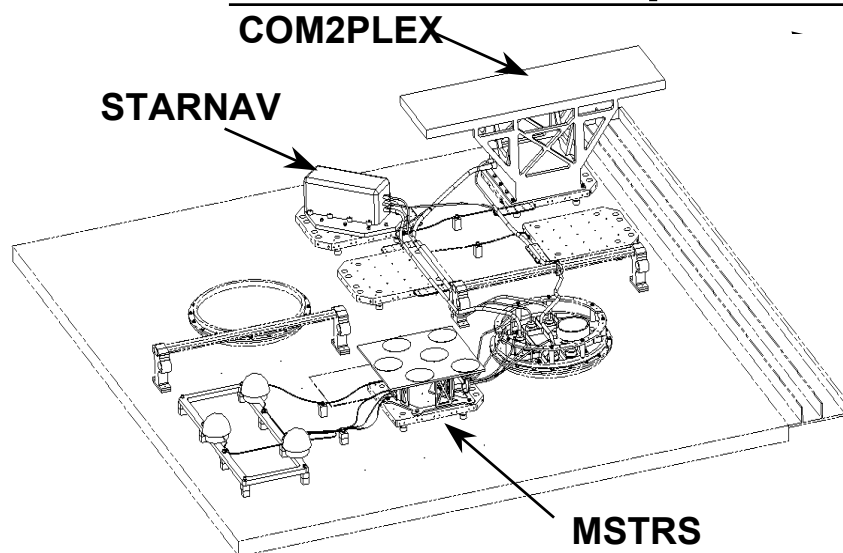


Module Rooftop Layout of Experiments

Presenter **Vanessa Ellerbe**

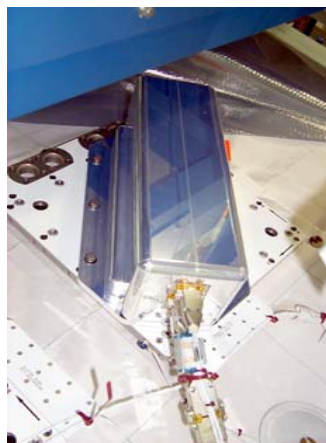
Date **01/09/03**

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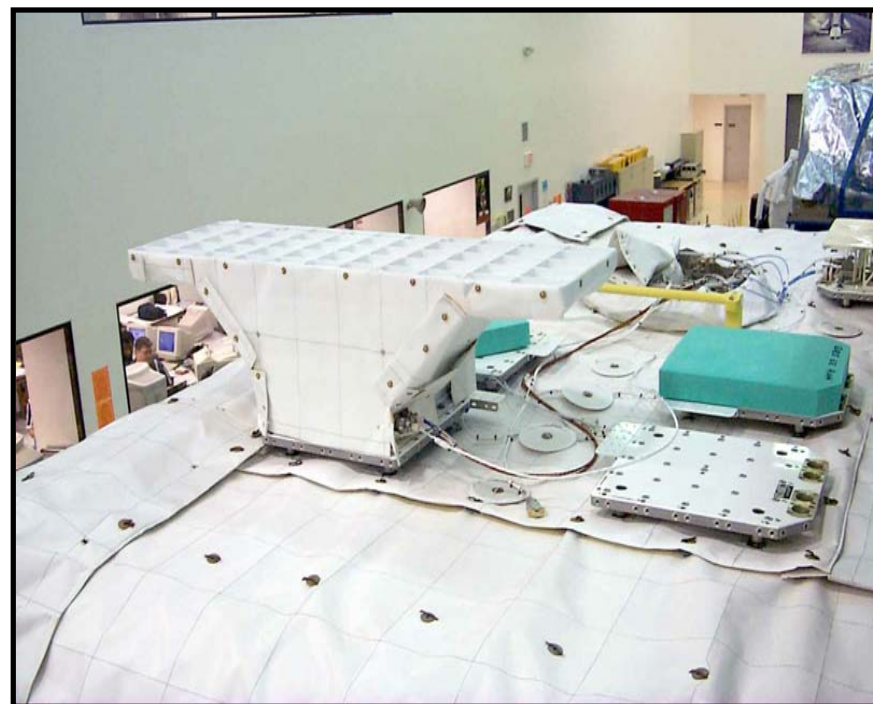
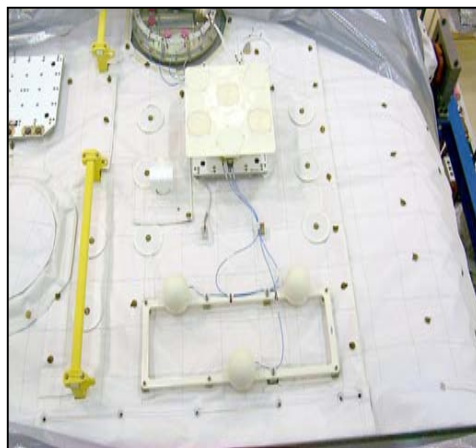


COM2PLEX

STARNAV



MSTRS





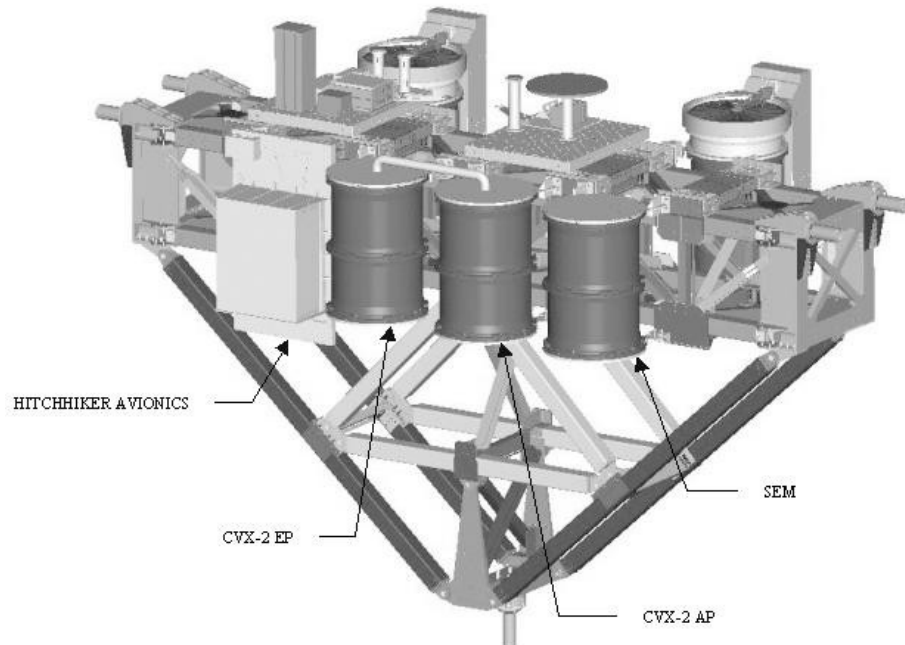
FREESTAR

Presenter **Vanessa Ellerbe**

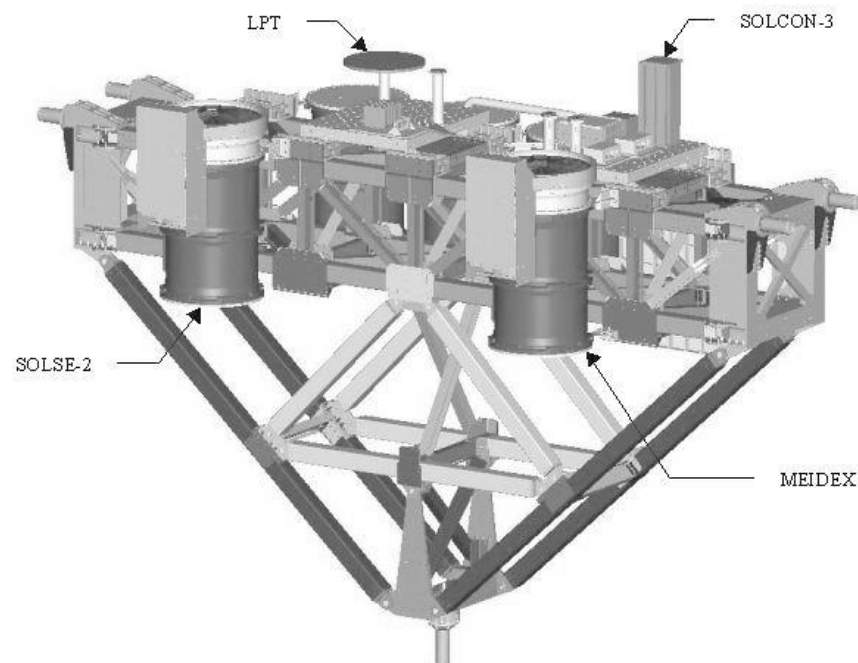
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FREESTAR Forward View



FREESTAR Aft View





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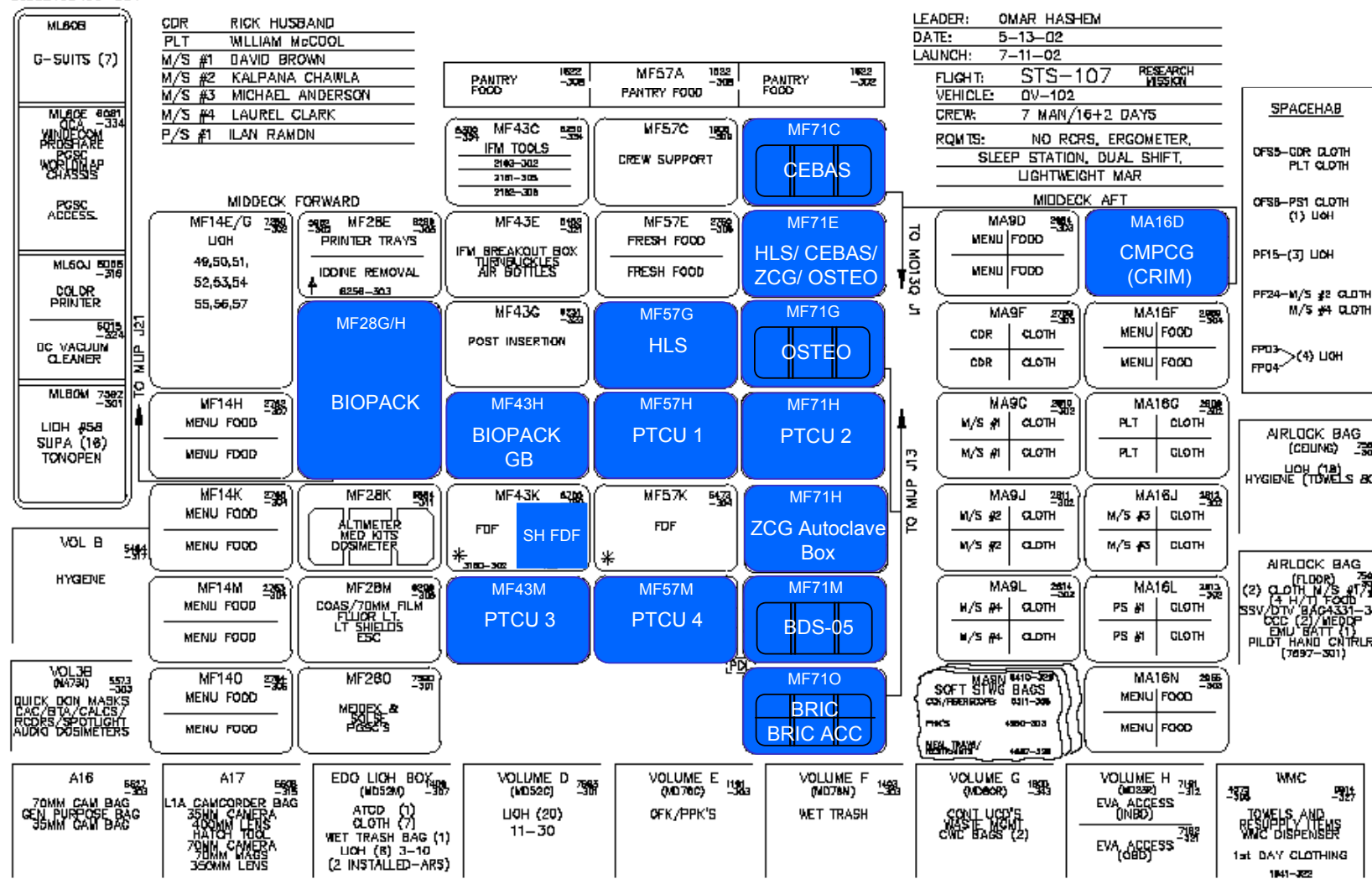
Middeck Layout of Experiments

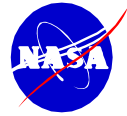
Presenter **Vanessa Ellerbe**

Date **01/09/03**

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LW MAR
SJD3210B409-334





Key Program Considerations

Presenter	Vanessa Ellerbe	
Date	01/09/03	Page 13

- **Dual Shift; 16 day mission; 39° Inclination**
- **Two Launch Attempts; Must Refurbish Module Payloads; 96-hour Scrub Turnaround**
- **First Flight Items**
 - **Research Double Module (RDM)**
 - **Ku-band (Commanding/Telemetry)**
 - **Upgraded Environmental System allows exercise in RDM**
- **First Extended Duration Orbiter (EDO) Mission Since STS-90 (April 17, 1998)**
- **13 payload LCC's; 3 Safety and 10 Mission Success**
- **Launch window 2.5 hrs (crew on back constraint)**
 - **T-9 minute hold is 10 minutes (40 minutes for ISS flights)**
- **Early payload retrieval available starting at Launch +48 hours (prime and back-up) landing sites**



BRIC Sample Canisters

Presenter	Vanessa Ellerbe	
Date	01/09/03	Page 14

- Late addition of 6 passive sample canisters (previously flown hardware) to BRIC Middeck locker per Code U request
- No crew activity required
- No payload integration issues
- Approved at January 7 Special PRCB, pending completion of PSRP analysis
- PSRP approval received 1/8/03



Payload and System Safety

Presenter	Vanessa Ellerbe	
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- **Integrated Experiment Hazards Assessment - Complete**
- **Toxicology Process**
 - Verification 1: Complete
 - Verification 2: Standard open work for late load items
- **Payload Safety Review Process - Complete**
- **No Non-compliance Reports (NCR's)**



Systems Integration Requirements Waiver

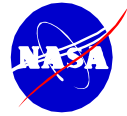
Presenter **Rod Wallace**

Date **01/09/03** Page **16**

- **STS-112 In-flight anomaly, IFA STS-112-K-01, "Ground PIC System A Failure at T-0", was dispositioned with mission-specific flight rationale for STS-113**
 - **Path A of SRB holddown posts pyros, and ET Vent Arm System pyros failed**
 - **Anomaly investigation has been completed – results scheduled to 1/16/03 PRCB**
 - **Previously-approved waiver, S050425AB, for STS-113 has expired--a waiver for STS-107 is necessary**
- **Waiver approved (Change Request S050425AD) for STS-107:**
 - **Waiver to NSTS 07700 Vol. V, "Information Management Requirements"**
 - **Failed to meet requirements of updates to hazard reports due prior to 30 days before FRR**
 - **Extends the STS-113 waiver for one more flight**
- **Hazard Report INTG-164 update will be submitted prior to 30 days before the STS-114 FRR**



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STS-107 Flight Readiness Statement

Presenter

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**THIS CERTIFIES THAT ALL MISSION REQUIREMENTS HAVE BEEN MET AND
SPACE SHUTTLE INTEGRATION IS READY FOR FLIGHT, PENDING COMPLETION
OF THE DEFINED OPEN WORK AND NOTED EXCEPTION**

/s/ R. Wallace for:

12/18/02

**L. D. AUSTIN, JR., MANAGER
SPACE SHUTTLE SYSTEMS INTEGRATION**

/s/ F. R Hinson for:

12/18/02

**H. N. HAMMOND, ASSOC. PROG. MGR
PROGRAM INTEGRATION
UNITED SPACE ALLIANCE**

/s/ H. Kunkel for:

12/18/02

**R. N. RICHARDS, PROGRAM DIRECTOR
SHUTTLE & SPACE STATION INTEGRATION
BOEING HUMAN SPACE FLIGHT &
EXPLORATION**

/s/ R. Galvez for:

12/18/02

**V. ELLERBE, FLIGHT MANAGER
SPACE SHUTTLE PROGRAM INTEGRATION**

/s/ L. Miller for:

12/18/02

**M. A. BREKKE, MANAGER
SPACE SHUTTLE CUSTOMER AND
FLIGHT INTEGRATION**

/s/ A. M. Larsen

12/18/02

**A. M. LARSEN, MANAGER
PAYLOAD SAFETY**

/s/ R. L. Segert

12/18/02

**R. L. SEGERT, MANAGER
SPACE SHUTTLE KSC INTEGRATION**



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STS-107 Flight Readiness Review

Backup Charts



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Agenda

Presenter

Date

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- **Program Integration - Flight Manager**
 - **Orbital Debris Status**
 - **Payload In-Flight Anomalies**
 - **Launch Commit Criteria**
- **USA Program Integration**
- **Boeing Integration**

Vanessa Ellerbe

No Issues

No Issues

No Issues

No Issues

No Issues



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Payload Summary

Presenter	Vanessa Ellerbe	
Date	01/09/03	Page 3

- **Biology, Physiology, and Biomedical**
 - **Advanced Respiratory Monitoring System (ARMS)**
 - **Closed Equilibrated Biological Aquatic System (CEBAS)**
 - **Osteoporosis Experiment in Orbit (OSTEO)**
 - **European Research in Space and Terrestrial Osteoporosis (ERISTO)**
 - **Physiology and Biochemistry 4 (PHAB4)**
 - **Biopack**
 - **Biobox**
 - **Bioreactor Demonstration System-05 (BDS-05)**
 - **Microbial Physiological Flight Experiment (MPFE)**
 - **Sleep-3**
 - **Fundamental Rodent Experiments Supporting Health-2 (FRESH-2)**
 - **Gravisensing and Response Systems of Plants (Biotube/MFA)**
 - **Biological Research in Canisters (BRIC)**
 - **Student Experiment Module (SEM)**



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Payload Summary (Con't)

Presenter	Vanessa Ellerbe	
Date	01/09/03	Page 4

- **Physical, Earth, and Space Sciences**
 - Facility for Adsorption and Surface Tension (FAST)
 - Combustion Module 2 (CM2)
 - Mechanics of Granular Materials (MGM)
 - Mediterranean Israeli Dust Experiment (MEIDEX)
 - Solar Constant Experiment-3 (SOLCON-3)
 - Shuttle Ozone Limb Sounding Experiment (SOLSE-02)
 - Critical Viscosity of Xenon-2 (CVX-2)



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Payload Summary (Concl)

Presenter	Vanessa Ellerbe	
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- **Space Product and Technology Development**
 - **Miniature Satellite Threat Reporting System (MSTRS)**
 - **Commercial Macromolecular Protein Crystal Growth (CMPCG)**
 - **Combined 2 Phase Loop Experiment (COM2PLEX)**
 - **Space Technology and Research Students Bootes (STARTS Bootes)**
 - **Star Navigation (STARNAV)**
 - **Advance Protein Crystallization Facility (APCF)**
 - **Vapor Compression Distillation (VCD)**
 - **Astroculture Plant Growth Chamber and Glovebox**
 - **Commercial Protein Crystal Growth – Protein Crystallization Facility (CPCG-PCF)**
 - **Commercial ITA Biomedical Experiment (CIBX)**
 - **Zeolite Crystal Growth (ZCG)**
 - **Low Power Transceiver (LPT)**



STS-107 Orbital Debris Status

Presenter	Vanessa Ellerbe	
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- **Orbital Debris / Micrometeoroid Risk Is Acceptable**

<u>Criteria</u>	<u>Risk</u>	<u>Guideline</u>
Critical Penetration	1 in 370	1 in 200
Radiator Tube Penetration	1 in 315	1 in 61
Window Replacements	88%	N/A

Average number of expected window replacements = 2.1



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Approved Payload
Launch Commit Criteria for STS-107

Presenter **Vanessa Ellerbe**

Date **01/09/03** Page **7**

- **STS-107 Minimum Equipment List (MEL) Mission Dependent (LCN 1100)**
- **SPACEHAB LCC**

SSID Number	RDM Title	Mission Success/Safety	LCC Timeframe	Monitored By
RDM-01	SPACEHAB HFA Fan Anomaly	Safety	T-6 hrs to T-31 sec	NASA/KSC
RDM-02	SPACEHAB Emergency Bus Voltage Anomaly	Safety	T-6 hrs to T-31 sec	NASA/KSC
RDM-03	SPACEHAB Smoke/Fire Anomaly	Safety	T-6 hrs to T-31 sec	NASA/KSC
RDM-04	SPACEHAB DMU Interface/Power Failure	Mission Success	T-6 hrs to T-31 sec	Customer from NASA/KSC console
RDM-05	Payload Aft Main B Critical Power Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console
RDM-06	SPACEHAB Main Power Anomaly	Mission Success	T-6 hrs to T-31 sec	Customer from NASA/KSC console
RDM-08	SPACEHAB Subsystem Water Loop Flow Rate Anomaly	Mission Success	T-6 hrs to T-31 sec	Customer from NASA/KSC console
RDM-09	SPACEHAB Water Pump Accumulator Quantity (high/low) Anomaly	Mission Success	T-6 hrs to T-5 min	Customer from NASA/KSC console
RDM-10	SPACEHAB Water Pump Inlet Pressure (high/low) Anomaly	Mission Success	T-6 hrs to T-5 min	Customer from NASA/KSC console
RDM-11	SPACEHAB Water Pump Outlet Pressure (high/low) Anomaly	Mission Success	T-6 hrs to T-5 min	Customer from NASA/KSC console
RDM-12	CEWPP Accumulator Quantity Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console
RDM-13	CEWPP Inlet Pressure Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console
RDM-14	CEWPP Outlet Pressure Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console



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**Approved Launch Commit Criteria for
STS-107**

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- **Approved LCNs Continued**

- **FCP RV Nozzle Heater Controller Anomaly (LCN 1110)**

- Update of instrumentation functionality requirements for H₂O Relief Nozzle, Alternate Product H₂O line and H₂O Relief Nozzle temperatures.
 - Modifies procedures for RV Nozzle Temperature Controller violations to address multiple failure modes.
 - Completion Date: 12/06/02



Approved Launch Commit Criteria for STS-107

Presenter	Vanessa Ellerbe	
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Approved LCNs Continued

- **APU Scrub Beyond Go/No Go (LCN 1082)**
 - Scrub of the APU section of the LCC
 - Completion Date: 12/12/02
- **New Requirements for ET/ORB Propellant Leak Visual Monitoring (LCN 1109)**
 - Creates new ICE-04 SSID requirements for visual monitoring of cryogenic propellant leakage at critical locations.
 - Deletes existing requirement in HAZ-12 to visually monitor ET/Orbiter disconnect for cryogenic leakage (now contained in new ICE-04).
 - Completion Date: 12/16/02



Systems Integration

Presenter	Bob White	
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- **All the Systems and Cargo Integration flight preparation activities have been completed except for planned open work – no issues identified**
- **Completed tasks include:**
 - Verification of compliance with generically certified requirements
 - Mission specific analyses
 - Documentation of vehicle and cargo requirements
 - Reconfiguration / installation of Payload Integration hardware
 - Payload bay clearance assessment
- **Light weight external tank (LWT) required mission–specific analyses to complete program certification (reference next page)**

Program Integration Is Ready to Support Flight



Systems Integration

Presenter	Bob White	
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- **The Light Weight Tank was included in the Performance Enhancement (PE) Certification Activity**
 - Approved via PRCBDs S052333CH & S052189DA and documented in NSTS 08209 Volume VII, Section 8.0
- **Due to a limited number of LWTs in the inventory, the LWT was excluded from post-PE generic certification activities and therefore required mission specific analyses**
- **STS-107 mission-specific assessments with LWT have been successfully completed:**
 - RTLS ET separation with 2-second mated coast extension
 - Launch probability with Ops High-q target
 - Thermal analysis for late TAL and 2-second mated coast
 - Liftoff loads analysis
 - Three liftoff load indicator exceedances cleared by elements
 - Integrated MPS pressurization analysis with Block II
 - GO₂ ullage pressure ICD exceedance cleared by ET Project; ICD waiver approved
- **Certification Completed - No Constraints to Flight**



SPACE SHUTTLE PROGRAM
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Integration CoFR Flight Product Status

Presenter

Date

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Cargo Integration

Last Updated: 12/04/02

STS-107	STS-114	STS-115	STS-116	STS-117	STS-118
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System Integration

STS-113	STS-107	STS-114
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GREEN: Primary and backup personnel in place to produce required products, or required products have been produced



YELLOW: Single string exists for required products



RED: Neither primary nor backup personnel in place for required products